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ROYAL AIRCRAFT ESTABLISHMENT

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December 1983

**SWEDISH DEFENCE RESEARCH
ABSTRACTS 1982/83-3**

by

National Defence Research Institute, Stockholm

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ROYAL AIRCRAFT ESTABLISHMENT

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Received for printing 1 December 1983

SWEDISH DEFENCE RESEARCH ABSTRACTS 1982/83-3

[FRÖ FÖRSVAR'S FORSKNINGS REFERAT 1982/83-3]

by

National Defence Research Institute, Stockholm

Translated by
D.P. Barrett

Translation edited by
M.G.B. Weedon

EDITOR'S SUMMARY

The Swedish National Defence Research Institute issues a quarterly list of unclassified Reports published by the Institute. The titles of these Reports and informative abstracts have been translated in English. This volume is the third issue of 1982/83. Further volumes will be translated in due course. The main topics covered are: protection - atomic, biological, chemical; ammunition and weapons; conduct of war, information and commands; vehicles and spacecraft; reliability and logistics; human factors; associated studies and their solutions; positive methods for limitation and control of armaments; psychology reports.

EDITOR'S NOTE

The Reports are in Swedish unless some other language is indicated (usually English). When requesting Reports it should be appreciated that an English version will not normally be available, and that the prices of the original Swedish documents have not been indicated in this Translation. Reports may be obtained from:

FOA Centralkansliet, 104 50 Stockholm, Sweden

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A PROTECTION - ATOMIC

A3 Effects of nuclear explosions, and protective measures

(113) FOA Report A40043-A3

Radioactive fallout from nuclear weapons. A review of airborne transport. Effects and measures

R. Bergman, S. Lindqvist, L. Johansson, O. Schelin, O. Lagerstedt,
K. Edvarson, R. Finck and G. Danielson

February 1983

This study concerns the state of the art of radioactive fallout problems in Sweden. Consequences of various fallout situations for the Swedish population are stressed, and information directed towards authorities involved in the planning for protective actions is given. The study emphasizes fallout caused by nuclear explosions outside Swedish territory, *ie* when Sweden is not directly involved in a nuclear war.

Distribution and properties of fallout fields are described. Radiation effects on man from external sources as well as internal sources (food-intake, inhalation etc) are considered. In addition consequences for agriculture and food production are investigated. Some radiation-sensitive new materials such as modern electronic components are discussed as well as a number of possible protective actions.

(114) FOA Report C30301-A3

SAPIENS Memo 4. Measurement of magnetic field peak strength outside SAPIENS
Torbjörn Karlsson and Sven Garmland

November 1982

In order to create an EMP test facility a 500 kV pulse generator may be installed in the FOA research simulator SAPIENS. This type of pulse generator will produce higher field strengths than the present pulse generator at FOA, so that an evaluation must be made of the risks of interference. The present measurement is intended to serve as a basis for a rough estimate of the interference.

(115) FOA Report C30312-A3

EMP protective properties in transient suppressors consisting of gas tubes and filters

Berndt Backlund, Sven Garmland, Torbjörn Karlsson
and Göran Undén

February 1983

Studies have been carried out on one type of transient suppressors in order to find out how the components of the device affect the protective function. The analyses reveal that the function of the gas tubes requires low-inductive connectors. An injected pulse with a current rate of rise of 20 A/ns lights the tubes within less than 2 ns.

The filter that was studied consists merely of an inductor and a zener diode. The residual voltage after the gas tube is attenuated fairly efficiently by the inductor, while the high-frequency components pass due to stray capacitance. The zener diode clamps the voltage only at the low-frequency part of the transient.

In order to increase the understanding of the functioning of the transient suppressor, calculations were also made on a simple circuit model. The results were then compared with measured values.

B PROTECTION - BIOLOGICAL

B1 Threat scenario

(116) FOA Report C40168-B1

Dengue virus - a biological weapon?
Ingrid Böhlin and Lena Norlander

February 1983

In the summer of 1981 an explosive epidemic caused by dengue virus broke out in Cuba. Fidel Castro accused CIA of causing the epidemic by using dengue virus as a biological weapon.

Dengue virus is commonly encountered in the tropical zone all around the world. It causes two different types of diseases, a relatively mild fever and a more severe form with haemorrhages and shock.

Dengue virus has occurred in the discussion about conceivable biological weapons since World War II.

In this report the properties of the virus, the pathological picture of the disease, and the epidemiology are described. The relevance of these factors in connection with the Cuban epidemic is discussed.

B4 Microbiology in overall defence

- (117) FOA Report C40167-B4
Microbial degradation of oil, research and development 1982, TOBOS 85 program
Roger Roffey and Anders Edlund January 1983

A study tour in USA and Europe has been carried out concerning microbial degradation of oil in the marine environment as part of a programme "Techniques for oil combat and clean-up" (TOBOS 85) sponsored by the Board for Technical Development (STU).

Areas of main research-interest concerning microbial degradation of oil are described. Topics that are presented include types and occurrence of oil degrading microorganisms, effects of oil on the microbial population, mechanisms for degradation and environmental factors effect on biodegradation.

The applied research work was directed towards the use of microorganisms for oil clean-up. Different methods to stimulate the microbial degradation of oil at sea or of oil sludges on land are discussed.

Some investigations in the marine environment are also presented briefly.

C PROTECTION - CHEMICAL

C2 Protective measures

- (118) FOA Report C40164-C2(H2)
Report from a conference on airborne mutagens and carcinogens and from visits to several research institutes in USA in June 1982
Mats Ahlberg January 1983

The Third Symposium on Environmental Analytical Chemistry; Airborne Mutagens and carcinogens, Provo, Utah, 16-18 June 1982 is reported. Furthermore visits to Stanford Research Institute, Menlo Park; Electric Power Research Institute, Palo Alto;; Hiac/Royco, Menlo Park; Nuclepore Corporation, Pleasanton and Laboratory for Energy-Related Health Research, Davis, are accounted for. The main emphasis concerns chemical, physical and biological characterization of airborne particulate matter in the working and the outdoor environment.

Methods for oil mist analysis and generation of test atmospheres are described. Possible contamination sources in the production of Nuclepore filters are discussed and two new optical particle counters under development at Hiac/Royco are described.

In an appendix all publications published by Environmental Assessment Department at Electric Power Research Institute from its start 1973 up to February 1982 are listed.

D AMMUNITION AND WEAPON TECHNOLOGY

D1 Technology of explosives

- (119) FOA Report C20483-D1 (in English)
 Boron containing fuel-rich HTPB-propellants. Manufacturing, burning experiments
 and specific impulse calculations
 Roland Sandén January 1983

Boron-containing HTPB-based propellants have been manufactured and test fired in a rocket motor. Amorphous boron is very porous and HTPB sticks to the acidic-boron surfaces. Hereby mixing and curing of the propellant are complicated especially at high boron contents. Different ways to reduce these problems have been tested in laboratory experiments.

Motor burning experiments have shown that much soot residue generally remains in the motor. By using HTPB-soluble ferrocene compounds and finely ground ammonium perchlorate and by burning conditions performed at low pressure these amounts can be reduced to a low proportion. With the boron granulated very fast burning propellants can be manufactured.

Performance calculations show that the volume specific impulse even at moderately high boron contents is considerably higher for the boron containing propellants than for kerosene or for fuel-rich propellants without metal additives. To what extent these high values can be realized has to be determined experimentally by afterburning with air.

- (120) FOA Report C20485-D1(D4)
 Sensitivity of EEDs to electromagnetic pulses - an estimation for assessing hazards in connection with stray fields from an EMP simulator
 Ola Lish February 1983

In 1981 an EMP simulator was erected close to an ammunition store at Malmén. A working group was formed to study the risk of prematures due to stray fields from the EMP simulator. Our task has been to deliver data on EED sensitivity and to carry out some additional tests.

This work showed that

- Common bridgewire EEDs can be expected to withstand 0.5 mJ in pin-to-pin ignition. A 20 dB safety margin should be used, implying that the spurious level should not exceed 5 μ J.
- Conducting composition EEDs cannot be expected to withstand the normal electromagnetic environment.
- The 50% fire level for a Type VA fuzehead tested pins-to-case in 22 μ J.
- The varnish around the pyrotechnic mix of an electric fuzehead should not be regarded as a protection against pins-to-case ignition.

D2 Gunnery technology and associated ballistics

- (121) FOA Report C20481-D2(D8)
 Recoilless light antitank weapon with countermissile
 Bengt Grabe (in English)
 January 1983

In this report is described a launching method based on:

- (a) the use of a countermissile to make the launching recoilless and
- (b) a special technique to increase the distance of acceleration in the weapon not only for the projectile but also for the countermissile.

In this way it is possible to establish a high muzzle velocity without too high pressure effects on the soldier by air shock waves from the launching tube. Separately also gas tight launching ('Armbrust principle') is treated.

D4 Warhead technology

- (122) FOA Report C20487-D4
 TRYCK. A command procedure for presenting the parameters of the shock wave from detonating high-explosive charges (in English)
 Bertil Tollbom March 1983

A program TRYCK is a command-procedure, which presents desired parameters of a shock wave from detonating high explosive charges. At present shock wave data for TNT- and FAE charges is available at the library of GUTS at Stockholm's Datamaskincentral (DZ).

D8 System studies

- (123) FOA Report C20486-D8(E3)
 A subset of GKS in ADA (in English)
 Bernt Andersson and Peter Söderquist March 1983

GKS, Graphical Kernel System, is intended to become a standard system for computer generated graphics. GKS provides a set of functions as an interface between an application program and the actual devices. A complete implementation of the system provides functions for a wide range of graphical applications from simple output to interaction in real time. GKS is divided into nine levels to adapt the capacity of the system to the requirements.

We show how a subset of the lowest GKS level could be implemented in the programming language ADA.

E INFORMATION AND COMMUNICATION TECHNOLOGY

- (124) FOA Report C30309-E
 Interface unit for relative humidity measurements with dew point meter
 Rolf Persson January 1983

In order to optimize performance and accuracy for the EG&G-220 Dew Point and Temperature Monitoring System and to compute and display relative humidity values obtained from measured data, the Interface Unit described here was developed during 1980.

The emphasis is put on the description of how an algorithm, which approximates a non-linear relationship, is adapted to a floating point package and used in a micro-computer program. This can be useful in various similar applications.

- (125) FOA Report C30314-E
 A broadband sub harmonically pumped millimeter wave mixer
 Staffan Rudner February 1983

In this work the properties of a broadband version of a novel type of balanced mixer, the subharmonically pumped mixer utilizing an antiparallel pair of beam lead Schottky diodes, have been investigated. Using a local oscillator frequency around 32 GHz mixer performance in the range 58-75 GHz was studied. The mixer had a conversion loss of 11.0 ± 1.6 dB over the band 58-67 GHz when optimized for broadband operation. This result compares well with other published broadband systems but is around 2 dB above the optimum result expected from theory. Between 67 and 75 GHz the conversion had a large resonance dip, probably due to an intrinsic LC resonance in the diodes that is typical for this mixing mode. New diode fabrication techniques which eliminate this

problem are already in progress which should make the subharmonically pumped mixer very attractive above 90 GHz.

E1 Reconnaissance, target location and fire control

- (126) FOA Report C30283-E1
 Multispectral television (in English)
 Carl-Hugo Ågren November 1982

This report describes a video system for multispectral observation in real time which has been built up using commercially available components. Various possibilities in realizing such a video system are described. The report also discusses limitations in spectral sensitivity imposed by detector properties. Two illustrated applications are commented upon.

- (127) FOA Report C30288-E1
 An approach to a pictorial information management system (in English)
 Jan-Olof Eklundh and Erland Jungert November 1982

The report describes ongoing work at FOA 32 on the development of an information system containing map and image data. Two issues are given particular stress: The first one concerns the input of map data in interpreted form into the computer. This goal is achieved by application of image processing techniques to the photographic (binary) overlays used in the map making. The second issue deals with the design of an object oriented information system, the objects being geographic entities with attributes. This system is built up as a Lisp-system on top of a relational database system.

The present status of the project is reported together with an outline of future work.

- (128) FOA Report C30292-E1
 Laser safety in air bathymetry
 Bengt Kleman January 1983

The report details threshold data for permissible irradiation by pulse-repetition green NdYAG radiation. On the basis of threshold data (the code of statutes of the National Swedish Board of Occupational Safety and Health AFS 1981:9), the flight data (altitude, speed) are discussed which are permissible for the irradiation at sea surface from the point of view of laser safety. Further, a review is done of the practical safety aspects of laser bathymetry from helicopters or aircraft. Especially emphasized is the necessity that the laser operator has full observational control over the part of the sea surface that can be hit by radiation of higher irradiance than the threshold value for permissible irradiation. Moreover, the risks in flights over islands and shores are touched upon, as well as the risks to animal life.

- (129) FOA Report C30300-E1
 A study of encryption in satellite communications
 Sven Nygren December 1982

This article presents a brief review of data-collection by photographic reconnaissance from satellites. It also discusses encryption and methods of cryptanalysis. Some practical experiments in the encryption of visual data are described, from which it can be deduced that a fixed-key cipher is not a suitable form of encryption, whereas methods using a variable key (eg additive ciphers) afford a high degree of security. Subjects also discussed include the future tendencies in the development of

electronics, encoding and image-processing. The article concludes with a brief history of cryptology.

This work was carried out at the Institute of Information Theory, Linköping Technical College, and has also been published as an Internal Paper LiTH-ISY-0552.

- (130) FOA Report C30304-E1
Using a pulsed TEA CO₂-lidar to measure atmospheric scattering and water vapour
G. Bolander, T. Claesson and O. Steinvall (in English) November 1982

This report has analyzed the usefulness of a pulsed CO₂-TEA lidar for atmospheric remote sensing. In a theoretical review the maximum ranges using atmospheric backscatter are investigated as well as methods for measuring the attenuation and scattering coefficients. The accuracy of the dial method for range resolved gas concentration monitoring is analyzed and an example of water vapour profiling is given.

Measurements were performed with a direct detection CO₂-TEA lidar. Emphasis was put on investigating the potential for single-ended extinction measurements in the 10 µm wavelength region. For horizontal paths good correlation was found between attenuation evaluated from atmospheric backscatter and from measurements against reference targets. Vertical soundings revealed a decrease in backscatter up to a factor 10 during the first kilometer. Range resolved water vapour was measured out to 1 km using a 75 m range cell

- (131) FOA Report C30307-E1
Equipment for recording the direction of incidence of infrasonic sound waves.
Technical description
H. Nygren January 1983

The report is a technical description of a stationary equipment for recording atmospheric infrasonic sound signals. The equipment is built up of three microphones, a signal-processing unit, and a microcomputer for the computation work. The apparatus is designed for narrow-band detection at 2 Hz.

- (132) FOA Report C30308-E1
Program to simulate helicopter rotors
Anders Wallin December 1982

This report describes a simulation program written in Fortran which generates images of a helicopter rotor as observed by an image-generating IR camera. The appearance of the images depends on the scanning system in the camera and the properties of the rotor. The rotor image can be supplemented by a function which simulates the fuselage of a helicopter. Correlated noise can also be added to the image in a rectangular distribution.

The simulation model is intended for use in studies of detection and discrimination algorithms against this type of target.

- (133) FOA Report C30310-E1
Annual Report 1982 February 1983
Laboratory for Computer Science (FOA 320) and Engineering Psychology and
Information Systems (FOA 530) (in English)

This report gives a brief summary of activities in Computer Science and Engineering Psychology and Information Systems during the calendar year 1982.

- (134) FOA Report C30311-E1
 Turbidity mapping of Swedish coastal water from satellite data (in English)
 Mats Jonsson December 1982

This report uses satellite data to estimate water turbidity in Swedish coastal water.

First a technical description is given of the earth resource satellites that exist and those that are planned to be launched in the near future. Then follows a chapter on electromagnetic radiation and how the radiation is affected on its way through atmosphere and water. The method used to produce the turbidity images is given in chapter 4. Finally, the turbidity images are shown together with some comments on each image.

It was observed that turbidity mapping by satellite gave good results provided that the calibration measurements were taken when the satellite passed. Another very interesting phenomenon that was discovered was clustering, that is areas in the water body where the turbidity was significantly higher than in the surrounding areas.

This report is supplemented by two other reports. The first (FOA Report D30233-E1) contains a users manual and a program description manual on the computer program that was developed to produce the turbidity images. The second (FOA Report D30234-E1) contains all the appendices which are referred to in this report. All reports have the same main title.

E2 Communications

- (135) FOA Report A30032-E2
 Simulation of multipath propagation over a digital radio link
 Stefan Mattsson November 1982

The object of this experimentally-based study was chiefly to throw some light on questions of the systematic constraints affecting digital high-speed radio links in the microwave band, and to find a measure of resistance to frequency-selective fading.

In order to clarify the constraints inherent in a system of multipath propagation, what is termed a Fade Simulator was constructed in hardware, capable of simulating a realistic multipath propagation situation in the microwave band.

Present-day radio link systems which were exposed to the Fade Simulator consist of two variations of a 4-phase-modulation system with a bit rate of 34 Mbit/s, in which the radio side operates at 2 GHz and 1 GHz respectively.

The introduction gives a description of different systems of radio link equipment and a theoretical study of different systems of phase modulation, including a discussion of the trade-off between utilisation of bandwidth and resistance to inter-character interference.

The simulations, in which measurements are made on both the time and the frequency axis, include both an analysis of the properties of systems using multipath propagation, in particular the effect of the fading channel on received signal strength, and a quantification of resistance to frequency-selective fading, which enables systems to be compared in terms of the risk of inaccessibility for a given frequency hop.

Various remedies have been studied for reducing the sensitivity to frequency-selective fading, including the smoothing of the received MF spectrum by a simple

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adaptive equalizer with a means of compensating for linear distortion in the received signal spectrum.

Besides the measurements obtained in the simulation experiments, which afford an insight into the vulnerability of systems to frequency-selective fading, attention is drawn to some of the 'weak points' of the systems in multipath propagation.

Finally some suggestions are offered of means for achieving radio link systems which are more resistant to multipath propagation.

E3 Guidance, navigation and target identification

(136) FOA Report C20482-E3

A study of K_ψ guidance (quasi-proportional navigation)

Anders Elfving

January 1983

The report treats K_ψ -guidance, *ie* guidance of a missile with body-fixed seeker and with body angle feedback in the guidance system. The advantages and shortcomings of this guidance method are discussed, starting with a very simple model of the missile. Some suggestions for modification of the guidance principle are given. Finally, these suggestions are tested using a more detailed missile model.

H HUMAN ENVIRONMENT

H1 Man in field environment

(137) FOA Report C54043-H1

International Conference on Protective Clothing Systems; Stockholm,
23-27 August 1981

(in English)

Kim Amundin, Carin Brunius and Åsa Bränd-Persson

January 1983

(138) FOA Report C54044-H1

Wild plants as food during 10 days of a 250 km survival march. Variations in the content of glucose and free fatty acids in blood and the excretion of ketone bodies by the participants

Stefan Källman

January 1983

A survival march was made over 10 days, from 27 August to 5 September 1982, 60 km north of Stockholm.

The participants covered about 250 km with minimum equipment and used wild plants for food. No sleeping bags, tents, matches or ordinary cooking utensils were used. No change of clothing was taken. The object of the investigation was to try to obtain results under realistic conditions which would support the view that wild plants can be used as food and supply the necessary quantities of carbohydrates in a survival situation with strenuous physical exertion.

The intention was to use plants wheregame and fish are not available. The brain is capable of utilising only carbohydrates as a source of energy. The increased consumption of fat to which keen hunger gives rise demands carbohydrates for the optimum utilisation of fatty acids in the muscles. This also prevents a high production of toxic ketone bodies.

The participants were parachute troops who were split into two groups:

A who had only wild plants for food,

B who were allowed to use food and three emergency rations per person for consumption on days 3, 6 and 9.

Samples were taken on five occasions to determine the amounts of glucose and free fatty acids in the blood and ketone bodies in the urine.

The results show that group A were able to maintain their blood sugar at a steady and high level during the march. They were also able to utilise the fatty acids without any high production of ketone bodies owing to the carbohydrate content in the plants. Group B tried fishing between days 1 and 5, which is the commonest means of procuring food in emergencies. However the results show that group B suffered a serious drop in blood sugar during these days and a very high production of ketone bodies owing to a lack of carbohydrates. After day 5 group B began to collect large quantities of plants which, in conjunction with consumption of the emergency packs produced an increase in blood sugar and a pronounced fall in the amount of ketone bodies.

A serious mistake in route-finding by group B on day 4 also shows the importance of carbohydrates in situations of escape and survival.

The results also demonstrate that emergency rations should be consumed during a period of 2(3) days, and that emergency rations should consist of a larger amount of starch than of mono and disaccarides. When the availability of emergency supplies is meagre, they should merely supplement a basic diet of wild plants in an emergency situation when demand intensifies.

The investigation shows that in this case plants could serve as food and supply the quantity of carbohydrate needed to maintain a physiologically correct level of fat consumption and a steady and high level of blood sugar, and also supply the brain with a proper substrate during a physically and mentally stressful survival situation.

- (139) FOA Report C54045-H1
Survive - motivation - preparation. Conference on survival research at National Defence Research Institute, Division 54, Work Environment Ursvik, Stockholm, 20-21 October 1982
Ulf Bergh, Arne Groth, Stefan Källman and Åsa Bränd-Persson February 1983
- The purpose of this conference was:
- 1 to discuss the problems of survival, especially for the armed forces, and how these problems can be surmounted;
 - 2 to inform about present research projects and results;
 - 3 to discuss future needs for research in this area.

The program consisted of lectures and practical demonstrations on the following subjects: bivouacs, fire, food and water supply, heating problems, equipment for primitive conditions arising from emergencies.

H2 Man and technical systems

- (140) FOA Report C53010-H2
Computer simulations of visual models (in English)
Ulf Nilsson, Hans Marmolin and Sten Nyberg December 1982

In this study computer implementations of some Fourier models of the human visual system are presented.

The result of a preliminary validity study indicated that one of the models could be used to illustrate the effect of visual disfunctions.

- (141) FOA Report C53011-H2
Experimental comparison of types of dialogue for data input
Kerstin Severinson Eklundh and Carl-Erik Hedin February 1983

- (142) FOA Report C56036-H2
General debating and the defence debate. Some problem areas
Hans Furustig December 1982

The report broadly discusses the following problem areas: criteria of debate, functions and obstacles to debating. The value of the debate is discussed in terms of its functions: to criticise, to create, to qualify and to communicate. Owing to the importance of these functions, it is valuable to pay heed to the obstacles to free and cogent debate. Among other things, debating constitutes an exchange of opinions between different points of view. This means that various types of unfair and irrelevant debating technique represent an obstacle to good debating. Some examples of fallacious arguments include the '*argumentum ad hominem*', the '*tu quoque*', '*post hoc ergo propter hoc*' and the '*argumentum ad ignorantiam*', which are explained. The report identifies the need to deepen the understanding of standards of debate among other things, and of problems of interpretation.

H3 Man and social systems

- (143) FOA Report C55056-H3
The theoretical formulation and construction of a check-list for perceived behaviour for characterization of military groups (in English)
Ben Shalit, Leif Carlstedt, Berit Ståhlberg Carlstedt and December 1982
Inga-Lill Täljedal Shalit

A nine-stage sequential adjustment model (SAM) is briefly discussed. An instrument-behavioural check list (BQ) is developed in order to assess overt group behaviour according to three of the stages. The 10 items of the BQ assess the state of the groups' adjustment coping potential in terms of their understanding, their willingness and their readiness. The results were analysed in terms of the structural relationships between the items, as perceived by the soldiers. The BQ was, on three occasions, filled in by about 110 soldiers from a Ranger Company from the North of Sweden. It was shown that in general the BQ items describe the three domains specified by the model, and in the expected order.

M INTERDISCIPLINARY STUDIES AND INVESTIGATIONS

M3 Security aspects of environmental studies

- (144) FOA Report B10035-M3
Changing strategic perspectives in Northern Europe (in English)
Nils Andrén

Strategic perspectives presently relate primarily to the changing conditions for the security of the Nordic countries in the East/West context. In a long term perspective their security goals are often defined as making the environment, regional or global, more 'peace prone' by helping to dissolve tensions, to increase the respect for international law and to create more social and economic equality in the international system as a whole. Changing strategic perspectives also include new ideas concerning possible threats emerging in the international system as a result of technological and economic developments. In domestic political debates and diplomatic

activities the political and military responses to short range threats and challenges normally play a smaller role than question of détente, disarmament and economic development, especially involving the Third World. This paper deals with the response of the Nordic countries to the old and new force in their regional and global strategic environment.

(145) FOA Report B10036-M3

A small but useful capitalist state - Sweden in current Soviet foreign policy
Ingmar Oldberg

Soviet policy towards its non-aligned neighbour Sweden reflects two types of thinking which are mutually complementary. One of them, in aggressive Marxist-Leninist distribses, sees Sweden as a small capitalist state firmly attached to the bulwark of imperialism, the United States. According to this view, which is held by the military in particular, the Soviet Union, being a socialist world power, has no need whatever to pay any special attention to Swedish protests where its own national interests are concerned. It is therefore permissible for the Soviet Union to sail nuclear-armed submarines into the Baltic. The desire to maintain an accurate watch on Sweden led to a Soviet submarine's running aground in Autumn 1981 inside a Swedish defence zone. The publicity surrounding this unprecedented event was countered on the Soviet side with an insistence on Swedish espionage and with sharpening criticism of Swedish armament and her policy of neutrality with reference to some recently-concluded Swedish arms deals with the USA.

The second line in Soviet thinking is the doctrine of peaceful coexistence among states with different social systems. According to this doctrine Sweden - although capitalistic - is economically developed and a valuable trading partner for the Soviet Union. Sweden can also be used as a means of pressure on her NATO neighbours and other worse enemies. Thus the Soviet Union appreciates Sweden's existing interest in détente and her resistance to American wishes to reduce her relations with the USSR because of the Soviet occupation of Afghanistan and developments in Poland. In her peace campaign to obstruct NATO's military concentrations, Soviet propaganda is fond of referring to the Swedish Government's interest in a Nordic nuclear-free zone, her anxiety over the arms race and occasional criticism of NATO and the USA, the independent disarmament commission of Olof Palme and the Swedish peace movement. The Nordic peace march in the Soviet Union in Summer 1982 was a vivid example of Soviet exploitation of western opinion.

Offprint from Kungl Krigsvetenskapsakademiens Handlingar och Tidskrift (1982),
4, pp 217-241; FOA Reprints 1982/83:8

(146) FOA Report C10208-M3

Essays on Swedish security in the Nordic environment
Nils Andrén

(in English)
June 1982

All the essays have previously been published in Swedish - in somewhat different forms and sometimes with slightly different purposes - as contributions in journals or books to the current debate on issues related to national security. Their themes vary but the underlying focal point - Swedish national security - and the basic ideas and beliefs concerning the viability and conditions of a consistent security policy, with a credible national defence as a necessary corollary, are the same. Sometimes this fact is reflected in unavoidable overlapping between the essays.

(147) FOA Report C10211-M3
Soviet Report. A scenario-oriented policy analysis
Gunnar Jervas

September 1982

This study is an attempt to disclose the underlying structure of Soviet foreign and security policy and to discuss some possible future developments. In order to make the report more useful in a policy context, it has been written from a number of different cardinal points of view, among which the policy towards Europe predominates.

Given that according to Soviet philosophy a military confrontation should be avoided where firm resistance can be expected, the main thrust in the European section is towards the strategy and future scenarios which are likely to arise short of the outbreak of a regular war. As regards policy towards the Middle East and East Asia, the military alternatives are also discussed.

Soviet ambitions in our part of the world are considered to be to stabilise the situation in Eastern Europe, to increase West European dependence on the USSR, to develop further military options as a mode of political pressure, to erode the Atlantic alliance and West European cooperation in a fairly manageable process, in which among other things the German question is used as an instrument of control. The geopolitical outlook from Moscow also means that the strategy towards the Middle East and East Asia should be designed so as to elicit the maximum response in the high-priority area of Europe.

M5 Defence economy

(148) FOA Report C10214-M5
Report on a questionnaire on experience of long-term planning activity in
the military forces ahead of Defence Plan 82
Jan Foghelin and Ingvar Svahn

September 1982

The long-term planning for military defence ahead of the 1982 Defence Plan was concluded in June 1980 when the Chiefs of Staff submitted Part 2 of the long-term plan to the Government. A questionnaire was conducted during the Autumn of 1980 to collect some experiences of working on this long-term plan. The investigation covered about 35 individuals who had in some way been involved in long-term planning (the suppliers of information, producers and recipients). Those interviewed included commanders on different levels on the Defence Committee, the Department of Defence, military staffs, the FMV and the FOA.

People were found to be generally satisfied with their involvement in the planning. However some indications were given of shortcomings and suggestions for improvements were made. Experience of activity in long-term planning is presented in the report under a number of headings, such as studies of the progress of war, threat scenarios, creativity, organisation/personnel and dialogues.

The report concludes with some suggestions from the authors for changes in long-term planning.

(149) FOA Report C10223-M5
Some questions of economics before the next round of long-term planning in
the defence services
Jan Foghelin

October 1982

In the context mostly of previous experience of long-term planning and the planned scheduling of work on the coming long-term plan, the following recommendations are submitted:

- Costs should be reported both in terms of costs of military units (breakdown by projects) and broken-down by production sectors. The distribution of costs by military units can be made both in the calculation of annual votes and payment returns;
- There is no generally best method which can be suggested for costing (marginal costs against average costs, or annual vote against payment returns etc). The suitable method(s) is/are determined by the statement of the problem. In general it can merely be said that the use of costings by annual votes should be toned-down compared with previous rounds of long-term planning. However, calculations of annual votes have their rightful place in comparisons of cost-benefit among different units;
- The most useful practical description of the budget consists of modes of action within tight economies, indicating those interconnections which exist (eg material covered by contract and logically-associated material (such as ammunition for artillery which has been procured etc));
- In order to identify development tendencies which may need to be discontinued, analyses should be made of the past and present in the chosen sectors;
- Alternative ways of varying the efficiency of defence over time should be considered. In economic terms this trade-off is between investments which take effect in the long term and current maintenance which yields a short-term effect. A non-zero costed rate of interest is not a good means of controlling efficiency over time, given certain preferences;
- A long-range view in future planning involves serious uncertainties, eg on the cost side. These uncertainties should be explicitly stated and discussed;
- Development of the current status and forecasts of development in factor prices should be produced if possible. The effect on the shape of the defence system should not however take place by mechanically controlling the price index, but by thinking-out changes in direction against a background of changes in relative prices, both past and future;
- In future planning one should attempt to clarify relationships. Some areas in which analyses and descriptions of relationships suggest room for improvement are the following:
 - organisation in wartime - peacetime organisation
 - organisation in wartime - defence industries
 - military, social and regional economics
 - peacetime organisation - emergency situations;
- Analyses and descriptions of possibilities for change (freedom of action) in the defence system should be made for different time-scales (variations of the starting-year and the length of warning periods). This type of analysis imposes a demand for special information on the production of tactical and strategic material (dynamic properties in production processes);
- Experiments should be conducted in the increased use of computers for cost calculations. This applies both to annual votes and mean payment returns;

- A good basis of information is naturally important for the effectiveness of future planning. Some important sectors include:
 - peacetime organisation, especially personnel
 - material costs (early estimates, costs in the maintenance sector, including follow-up investments)

M8 Joint research and study projects

(150) FOA Report C10210-M8

Facts, methods, programs and paradigms
Per Agrell

July 1982

The practice of operational analysis in FOA is summarised and expressed in a partly new system of concepts. The significance of using or of not using this type of distinction is illustrated by some examples.

T SPECIAL MEASURES FOR LIMITATION AND CONTROL OF ARMAMENTS

T1 Seismological multiple stations

(151) FOA Report C20484-T1

(in English)

Common data base experiment - event definition from short-period wave form data
Nils-Olov Bergkvist, Eva Johannisson and Ingvar Nedgård January 1983

This report, which is divided into three parts, describes how the short-period wave forms (level II data) can be used to check the definition of small events defined in CDBE, to define new events using the reported array parameters azimuth and slowness and to explain reported arrival times that could not be associated to any event in CDBE.

Twenty-three small events defined by CDBE but not by US Geological Survey were analysed, and for all but one the definition was supported by level II data.

In the second study unassociated array detections were analysed in a search for new events. Through analysis of complete wave forms new arrival times could be associated and 38 new events were found.

In the last study unassociated arrivals reported by two single stations were investigated. More than two-thirds of these arrivals could be explained in the level II analysis or from known events reported by US Geological Survey.